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hole was lined with vegetable fibers and contained three babies, just hatched and with eyes not yet opened. The next day I found them covered with a thin growth of long black down. The mother kept to the nest most of the time, but I observed the father hunting through the grass in the vicinity more than once. The babies remained in the nest about two weeks.

Young birds have been seen to fly as early as the end of June at the lower elevations; and as late as August 12 I have found them in the same stage at higher altitudes. I have not been able to determine whether the mountaineers are second broods or not. Regularly, as early as the middle of August, the Juncos are in small flocks.

*Yellowstone Park, Wyoming, June 28, 1920.*

## THE FUNCTION OF POWDER DOWNS IN HERONS

By ALEXANDER WETMORE

WITH TWO PHOTOS

THE curious fluffy, greasy tracts of feathers found in patches on the breast and pelvic region in herons and occurring at random in various other groups of birds, even in the Passeriform order, have been the subject of considerable speculation and comment. Some time ago I had opportunity to study their development in the young of a few species of herons and from these observations was able to settle definitely their function so far as concerns this group of birds at least. Observations were made first while rearing a young Great Blue Heron (*Ardea h. treganzai*), and were checked and verified in the young of the Snowy Heron (*Egretta c. candidissima*), Black-crowned Night Heron (*Nycticorax n. naevius*), and Bittern (*Botaurus lentiginosus*). It is interesting to note that my findings verify a possible function of these tracts as suggested by Newton and Gadow (Dictionary of Birds, 1896, p. 654). In the young Great Blue Heron powder down tracts produced functional feathers soon after the contour and flight feathers had burst their sheaths and the bird began to preen and care for its plumage. The heron in question had been taken from the nest while still too young to know fear of man, and as I reared it by hand it became devoted to me, though fierce and truculent toward all others. As its plumage developed I noted that the bird constantly rubbed the bill in the powder downs, and on examination found that the heron was utilizing the greasy, powdery substance given off by the tracts to dress and oil the contour feathers. The bill was worked in among the powder downs until a small amount of the exuviae had gathered at the tips of the mandibles and then contour or wing feathers were pulled rapidly through the bill, anointing them with this oily substance. At once return was made to the powder downs after which other feathers were treated in turn until the whole of the body and wing plumage had been properly dressed. I had no difficulty in observing the process as, when permitted, the heron until practically grown delighted in standing upon my knee as I sat in a chair. I was able to place my fingers in

beside the tip of the bill, in the powder downs, to feel the mandibles gently nibbling at the downy feathers and then to see the bill withdrawn with its sides covered with the grayish powder. Following this I observed as it was passed over other feathers. This process was repeated daily whenever I cared to see it. At the same time I discovered by examination that the uropygial gland, the usual source of oil for feathers seemed undeveloped and remained in a non-functional condition until the heron was practically grown. The bird in early life paid no attention to this gland but worked in either pelvic or pectoral down patches. The actual development of the oil gland I did not observe as the heron at this stage became so vicious toward others that I was forced to discourage its tameness until finally it left the laboratory.

When attention was attracted to this peculiarity in the Great Blue Heron I took occasion to examine other young herons and found a similar condition existing in Snowy Herons, Black-crowned Night Herons and Bitterns. The accompanying illustration (fig. 36) shows well the relative size of the powder down tracts and the non-functional oil gland in a young Great Blue Heron

(*A. h. treganzai*) about two-thirds grown. The oil gland is the small rounded object at one side between the two pelvic tracts. In another cut (fig. 37) the young Great Blue Heron is shown securing the greasy material from the powder down patch on one side of the breast.

Parenthetically I may add that although on various occasions I examined powder down tracts in living and in dead herons I was unable to observe that these tracts were luminous, in spite of numerous records on the part of others, to the contrary.

Since making these notes on powder downs it has been my inten-

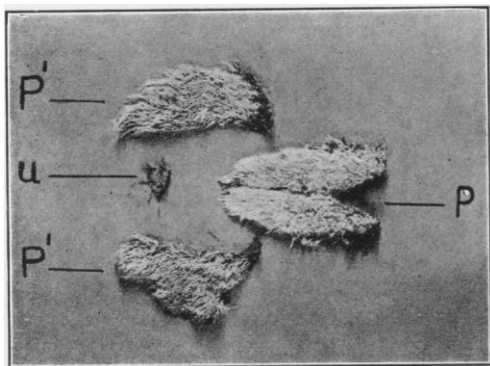


Fig. 36. POWDER DOWN PATCHES AND UROPYGIAL GLAND FROM GREAT BLUE HERON ABOUT TWO-THIRDS GROWN, DISSECTED FROM FRESH SPECIMEN TO SHOW RELATIVE SIZE. *P* PECTORAL POWDER DOWN TRACTS; *P'* PELVIC TRACTS; *U* DEVELOPING UROPYGIAL GLAND (NOT YET FUNCTIONAL).

tion to go farther into this subject and to study the development of these feathers and also of the oil gland. As a matter of fact powder downs are so little understood that ordinary definitions of them in text-books are vague and uncertain and their recognition in certain groups of birds is at times difficult. Where these downs are not segregated in definite tracts but are diffused through the pterylae it is possible, without careful attention, to confuse them with other feathers that have just begun to break their sheaths when in process of development. Similarity in function between powder downs and oil gland has suggested that these two organs may be homologous in origin. Should it prove that the powder down tract is a primitive arrangement from which the more complicated oil gland has developed then we may have a ready explanation for the occurrence of powder downs apparently at random in such diverse groups as Tinamous, the Whale-headed Stork, the Kagu, Sun Bittern, Mesite, herons and bitterns, the diurnal birds of prey (where they may be found in

many other species than currently recognized), parrots, Frogmouths, Potoos, Leptosoma and lastly in the Wood Swallows among the passerines. The structure of the oil gland with its numerous coiled tubes secreting fluid into a common chamber which in turn discharges the oil through one or many orifices

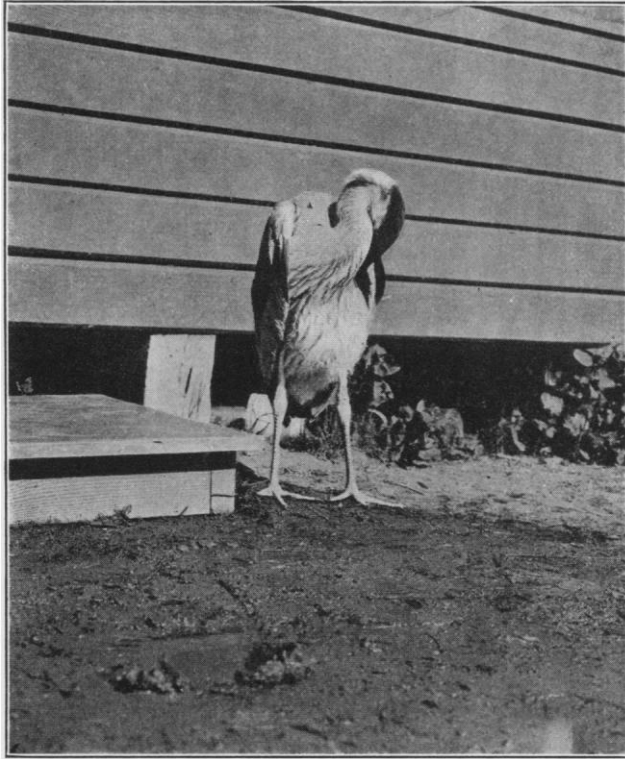


Fig. 37. IMMATURE GREAT BLUE HERON OILING MANDIBLES BY WORKING THEM IN POWDER DOWN PATCHES PREPARATORY TO PREENING CONTOUR FEATHERS.

to the surface might suggest an origin through the amalgamation of a number of separate tubes opening separately. All this, however, is pure hypothesis that may be verified or overthrown by careful study of the embryology of these structures.

*Biological Survey, Washington, D. C., May 26, 1920.*